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Redacted VERSION

ES&H/WM Safety Survey Report
of W48 pit serial number 4902
HE Removal and Packaging Operations
at the
USDOE Pantex Plant

December 7, 1992

ABSTRACT

This safety survey group examined the proposed W48 HE removal and packaging operations for pit serial # 4902 that are to be conducted at the Pantex Plant. This safety study group concluded that the proposed operations are safe for the personnel and environment. This study group recommends proceeding with the proposed operations.

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Safety Survey Report
of W48
HE Removal and Packaging Operations
at the
USDOE Pantex Plant

This report has been approved by the following members of survey group.

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I. PURPOSE AND BACKGROUND

On November 12, 1992 at approximately 9:53 am, the shell of the W48 pit, serial # 4902, cracked during the normal HE removal process. The main charge was removed therefore this occurrence does not involve a nuclear explosive.[1] Less than 100g of residual HE remains bonded to the pit. The HE for the W48 is PBX 9404 and is bonded to the pit with Adiprene L100 adhesive. This safety survey reviewed the proposed procedures and safety precautions to complete the HE removal and package the pit into a container for shipment to Lawrence Livermore National Laboratories (LLNL). Though this proposed process is not time critical as in "emergency" proportions, it is time urgent in that every day adds potential risk. The factor that is primarily adding risk is that the crack in the shell exposes a small surface area of plutonium to the humid air in the containment bags.

II. SCOPE

The study group met routinely from November 18 until November 30 to examine the procedures, equipment, special tooling, and administrative controls to be used during HE removal and packaging of serial # 4902.

III. FINDINGS

Overview[2]

The pit consists of plutonium, surrounded by a shell. Additionally the pit contains a The HE is bonded to the pit with Adiprene L100 adhesive. Due to the crack in the shell, the residual HE is alpha-contaminated. Before shipment to LLNL, the remaining residual HE must be removed. The proposed operation is for LLNL plutonium handlers to remove the residual HE in a glove box with the assistance of a LLNL HE Safety Specialist. After the remaining residual HE is removed, the pit will be packaged into a H2030-1 container then passed into a tent. The H2030-1 container will then be purged and backfilled This container will then be packaged into a FL container for over-the-road shipment.

Criticality Safety[2]

The W48 pit is subcritical (safe) when dry or externally flooded. In the event of internal flooding, the W48 pit remains subcritical if the hydrolyzed plutonium remains confined to the pit volume. However, if the hydrolyzed plutonium becomes dispersed in a larger volume of water, it could become supercritical (dangerous) between spherical volume limits of about

where the spherical volumes are surrounded by a thick layer of water (8 inches or more).

Contamination Hazards[2]

Plutonium emits both alpha and gamma radiation, as well as a very low neutron count from occasional spontaneous fission.

The gamma and neutron radiation account for the relatively high external exposures to the whole body and extremities. Internal exposure results from inhalation or inhalation of the plutonium particulate. The Annual Limit of Intake (ALI) is 0.005 microcurie or 0.08 micrograms.

Personal Protective Equipment

Requirements for personal protective equipment were jointly agreed upon by Industrial Hygiene and Radiation Safety. To enter the corridor of the cell, personnel must have whole body dosimeters and have a plutonium bioassay for baseline measurements. Personnel entering the round room (i.e. Radiological Buffer Area) will be in full anti-c's (coveralls, booties, and gloves) and have a full face respirator at hand. Only modesty (i.e. gym shorts and tee shirts) clothing is allowed under the anti-c's. The gloves will be taped to the sleeves. Personnel entering the tent (i.e. the contamination control area) must wear double anti-c's (double coveralls, double booties, and double gloves), a full face respirator, and a hood. All respiratory protection equipment will be supplied by the Pantex Respirator Program. All personnel requiring respiratory protection shall be approved through the Industrial Hygiene Department prior to issuance of the equipment. The glovebox gloves have been checked and are adequate for both radiation and chemical solvent concerns. Glass lens glasses are not being required for personnel during glovebox operations. Removal of personal protective equipment will be per Radiation Safety's Work Permit (RWP) and per direction of the Radiation Safety Technicians (RST). Four SCBA's will be stored outside the cell for use by designated personnel if needed. Since the anti-c suits will be worn over modesty clothing only (no outer personal clothing allowed) and

attached to the exhaust lines of both the box and tent. Work inside the tent will be accomplished in full face respirators.

HE Safety[3]

The Engineering Instruction for this proposed process was developed using proven and established Pantex Plant disassembly procedures. Additionally, the use of acetone is approved to dissolve small quantities of HE. Any excess acetone will be absorbed in the diaper paper. Technicians shall be knowledgeable of characteristics and handling of HE.

Safety Analysis Report for Building 12-98[4]

The ES&H/WM, Risk Management Department, (RMD) has reviewed the Building 12-98 Safety Analysis Report (SAR) to identify any potential concerns with the currently proposed activities. These activities will include the use of a glove box with an attached tent. Additional safety features and equipment used with the box and tent are described below:

- Glove Box / Tent. The glove box will be provided with a negative pressure environment and an argon atmosphere. Oxygen monitoring will be provided inside the box and in the cell. The monitoring in the box is for fire protection (<3%) and the monitoring in the cell is for worker safety (>19.5%). The tent will serve as a contamination boundary when materials are moved into or out of the box.

- Glove Box HVAC System. The exhaust from the glove box will be directed through two certified HEPA filters, and then to the task exhaust. An alpha CAM will be connected to monitor the exhaust downstream of the first HEPA. The flow rate for the glove box exhaust is approximately 135 cfm. Since the Task exhaust is designed for a minimum of 500 scfm (measured this week at approx. 750 scfm), the box exhaust should present no concern.

- Tent HVAC System. The tent will use a simple recirculation system, including dual certified HEPA filters on the exhaust. An alpha CAM will monitor the exhaust prior to the HEPA filters. This filtered air will be exhausted directly through the HEPAs into the round room atmosphere. Since the exhaust flow rate is approximately 1000 cfm, this exhaust cannot be connected to the task exhaust.

- UV Detectors. A question has arisen pertaining to the capability of turning off the UV detection system for photographs, X-rays, etc. The current SAR for 12-98 does not require that the UV protection system be left on during all operations. Therefore, turning off the UV detectors for these purposes does not violate the SAR or OSR requirements.

The equipment design described above, in conjunction with continuous operational support, should provide more than adequate protection as evidenced by a systems safety evaluation performed by the RMD[5]. Since this equipment is considered to be tooling, its installation does not constitute a facility change. Also, per our review of the SAR, this process is well bounded by the safety analysis, and does not constitute an operation outside the safety envelope of the SAR.

Industrial Hygiene

In addition to providing input about personnel protective clothing, Industrial Hygiene Department has reviewed the proposed process and addressed the following issues.

- Ventilation Survey (See attached drawing). The glovebox task exhaust hose is purposefully simply inserted into the bay task exhaust hose (i.e. not hard connected). This eliminates the potential for a positive pressure buildup inside the glovebox in the event of a RAMS alpha alarm that causes a mechanical closing of the bay task exhaust duct. Specifically, a RAMS alpha alarm shutdown involves a mechanical closing of a damper within the bay task exhaust duct in addition to electrical shutdown of the airflow. If this occurs and if the two ventilation systems were hard connected with duct tape, etc., the glovebox fan would continue to run, but would not be able to properly exhaust out through the bay task exhaust. This condition could lead to a positive pressure inside the glovebox and a potential for release of contamination from the glovebox. To eliminate this possibility, the glovebox task exhaust hose is simply inserted (i.e. open connection) into the bay task exhaust hose. Then, in an alpha alarm shutdown, the HEPA filtered atmosphere from the glovebox continues to flow and maintain the required negative pressure within the glovebox.

  Markers were added to the existing bay task exhaust manometer to enable personnel to ensure proper flow throughout the process.

- Oxygen Deficiency Survey. The glovebox will be purged with argon gas. Up to eight gas cylinders of argon will be located in the cell. One cylinder of backfill gas will be in the cell for the packaging process. All additional argon cylinders will be staged in the interlock. Based on the attached oxygen deficiency calculation, a potential oxygen deficiency in the cell is not plausible; however, oxygen monitors will still be utilized during the process. The sensor for the building oxygen monitor is located approximately six feet from the floor on the wall near the bay task exhaust hose rack. Since argon is heavier than air, an additional portable oxygen monitor will be located approximately one foot off the floor near the argon manifold system. An additional backup portable oxygen monitor will be available in the staging area outside the cell. In the event of an oxygen monitor alarm, all personnel will evacuate the cell. Industrial Hygiene will be contacted. Reentry to the cell will then require SCBA's which will be located outside the cell. The building oxygen monitor, which is located at the entrance to the cell, was checked through the Preventive Maintenance program this month (11/92). The portable oxygen monitors are current in the plant calibration program and are checked against ambient air by the monitoring technician just prior to use.

- Noise. Hearing protection will not be required for this process. Noise levels in the cell were determined by survey to be 72-73 dBA. The highest level was 79.5 dBA at the glovebox fan located at the entrance to the round room. Glovebox operators will use voice-actuated headsets to ensure communication during that portion of the operation.

- Acetone. Only 1/2 pint of acetone will be in the glovebox at any one time. Additional 1/2 pint containers will be stored in the flammable storage cabinet. The total amount of acetone will be less than 1 gallon. When used, the acetone will be enclosed in the glovebox and vented into the bay task exhaust. In the event that the bay task exhaust shuts down, the total possible amount of acetone vapors within the volume of the cell would never reach the action level for acetone.

Fire Protection

Fire protection within the glovebox is achieved by providing an inert atmoshere using argon to reduce the glovebox oxygen level. The oxygen level monitor will provide a local alarm.

Fire protection in the round room is provided by a ceiling level deluge system. Automatic activation is by ceiling level heat detectors. Manual activation is by a manual deluge valve on the deluge riser and by two manual deluge switches; one at the round room's entrance, the second at the exit door in the corridor to the personnel airlock. Fire protection to the remaining areas of the cell is provided by a wet pipe system. There are smoke detectors in the cell's air ducts that would detect the presence of smoke in the system.

Local fire alarm annunciation is provided by a rotating red light in the round room, a fire alarm bell in the cell's corridor and a rotating red light outside of the cell in the building ramp.

Environmental Concerns

The proposed project was evaluated in accordance with the National Environmental Policy Act (NEPA) and the Environmental Checklist is attached (Attachment IV). From the information provided and the environmental monitoring performed, there is no indication that radionuclides were released as a result of this event. Thus, Pantex Plant compliance status with 40 CFR 61 Subpart H remains unchanged as a result of this event. A continued demonstration of compliance with 40 CFR 61 shall be maintained as part of the proposed project.

Any waste generated as a result of this event will be analyzed (via process knowledge) as to its radionuclide, as well as, its chemical content to assure the proper storage, treatment, and disposal of all materials generated. Environmental Protection Department staff members will be involved in the characterization and determination of the storage, treatment, and disposal of the materials generated as a result of this event in order to assure a continued demonstration of compliance with 40 CFR 261, 262, 264, 31 TAC 335, and DOE AL guidance.

Note!

- Waste Management. Several waste streams which were in place for routine 12-98 Cell 1 operations are now being managed as suspect plutonium contaminated. In addition several waste streams are anticipated from the proposed process and decontamination process. Waste management practices for the waste generated during normal operations and the waste generated from the time of the incident will be managed according to Engineering Instruction AE 92-308 and the W48 Incident Waste Management Plan[6].

The proposed project/activity does not require a local, state, or federal permit/notification.

Packaging Concerns

Type 45 adapters (heatsinks) will be secured to the pit. The pit - adapter assembly will be centered in a H2030-1 Size B Containment Vessel against the bottom to allow maximum heat dissipation. The H2030-1 will then be filled with the aluminum heat dissipating material from an H1616 container. The H2030-1 will be evacuated through a 0.5 micron filter and a calibrated pressure gage that will monitor both positive and negative pressure. The backfill with gas will also be through a 0.5 micron filter. The H2030-1 will then be packaged inside the containment vessel of a Model FL Container with the special adapters designed and tested by EG&G at Rocky Flats. The FL Container with the special adapters for the H2030-1 containment vessel was drop tested successfully at Rocky Flats.

The capscrews and bolts securing the special adapters will be torqued to 25 pound - inches. The O-rings and FL Containment Vessel Lid will be installed and torqued to 70 pound - inches and the FL Container assembled, weighed, and surveyed in a manner to ensure compliance with the FL Safety Analysis Report for Packaging.

The packaged Model FL Container will be loaded into an SST and tied-down per the DOE/AL approved tie-down procedures. The container will be shipped "Exclusive Use Only", the one FL Container in the SST.

Training Issues

A briefing on emergency response will be provided to personnel entering the cell. This briefing will include response to the various alarms, which include CAM, O_2, and Fire alarms. Additionally, a briefing on HE handling will be provided to the personnel. LLNL is responsible for HE Safety and Handling Training of their personnel and will certify that this training is equivalent to Pantex Plant training. Chelation treatment (DTPA) briefing will also be provided to the personnel.

Conclusions

The proposed process to remove the residual HE from the cracked pit then package the cracked pit into a FL container via the H2030-1 is a safe operation. All the environmental.

not pose a threat to the environment or personnel safety.

IV. REFERENCES

1. The determination that this is not a nuclear explosive received concurrence from Frank Rider, DOE/AL/WSSB/NESD, on the date of the occurrence and again on November 18, 1992.

2. From "Nuclear Explosive Safety Study of W48 Disassembly Operations at the USDOE Pantex Plant (U)" dated April 22, 1992

3. HE Safety is per the DOE Explosives Safety Manual.

4. Final Safety Analysis Report (SAR) of Building 12-98.

5. Systems Safety Evaluation of W48 Pit, Serial Number 4902, HE Removal and Packaging Operation at the USDOE Pantex Plant.

6. W48 Incident Waste Management Plan.

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Attachment I

DOE/AAO Documentation of Nuclear Explosive Safety Determination

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United States Government | Department of Energy

memorandum

Albuquerque Field Office
Amarillo Area Office

DATE: NOV 2 3 1992

REPLY TO ATTN OF: AAO:LJT

SUBJECT: W48 Incident (11/12/92) Reviewed by Nuclear Explosive Safety

TO: L. M. Paradee, Chief, OSMB

On November 12, 1992, the Amarillo Area Office (AAO) Nuclear Explosive Safety/Environment, Safety and Health Management Branch talked with Nuclear Explosive Safety Division, Albuquerque (AL) about the W48 incident and the configuration of the components involved. There was concurrence between AAO and AL that the components and their configuration in the incident are not a nuclear explosive and do not create a nuclear explosive safety concern. On November 18, 1992, the nine member Nuclear Explosive Safety Study Group (NESSG) viewed a Secret Restricted Data video recording of the incident and were briefed by design laboratory representatives. The NESSG on November 18, 1992, also concur that the components in the present configuration do not create a nuclear explosive safety concern.

If you have any other questions regarding this matter, please contact Leroy Thompson of my staff at extension 3139.

A. Ladino

A. G. Ladino
Chief, Environment, Safety and
Health Management Branch

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Attachment II

Ventilation Survey

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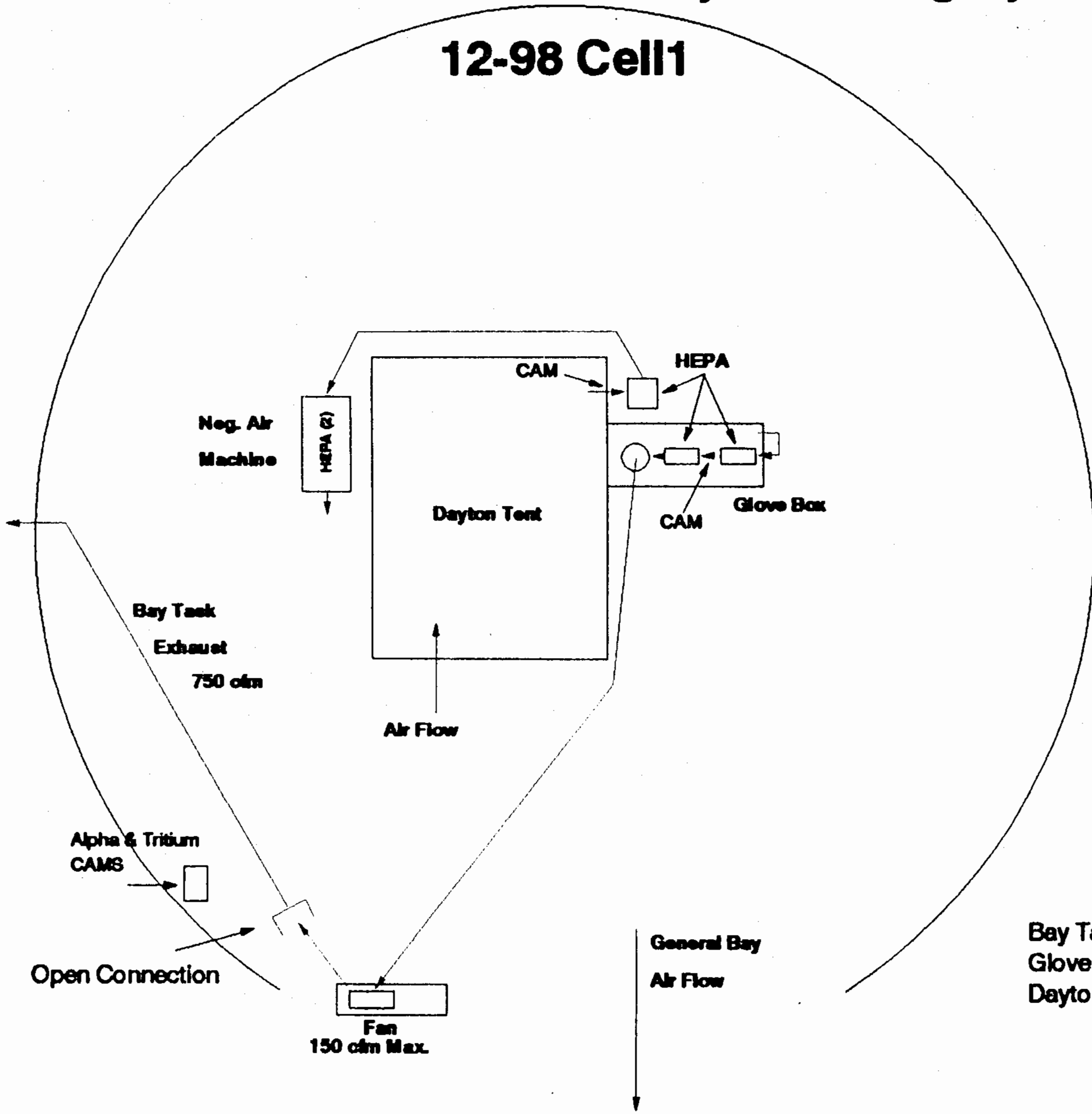
W48 Recovery
Verification of Ventilation System Integrity

12-98 Cell1



All ventilation lines are negative pressure except the short line from the fan to the bay task exhaust.

All connections on the glove box exhaust system were checked for leakage. None was found (positive or negative).

The glove box was verified during the DOP check.

The bay task exhaust has sufficient flow to handle all of the flow from the glovebox fan even at maximum capacity.

Survey Date: 11/20/92

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Attachment III

Oxygen Deficiency Calculations

Attachment IV

NEPA Checklist

PX-2114
5/92

BATTELLE PANTEX
ENVIRONMENTAL CHECKLIST

Project/Activity Title: Building 12-98, Cell 1 Incident	Project/Activity Number: 92-S-75-SESH75 Date: 12-01-92
Department/Division: Assembly Engineering	NEPA ID Number: PXP-92-0045
Division Contact/ES&H Coordinator: R. L. Benson / P. D. Stewart	Signatures: Ronald L. Benson [signature]

A. BRIEF PROJECT/ACTIVITY DESCRIPTION:

During the W48 high explosive (HE) pit separation process at the Pantex Plant in Building 12-98, Cell 1, the pit cracked. The thermal shock process involves liquid nitrogen and hot water to remove the HE from the pit. In a normal operation, the HE is completely removed from the pit during this process. In this incident, after approximately 98% of the HE had been removed, when hot water was running over the pit, the outer shell cracked. The residual HE is estimated at 100 grams.

Procedures for handling of the cracked pit are under intensive evaluation by Mason & Hanger, Battelle, and Lawrence Livermore National Laboratory at this time. Any considerations would be analyzed thoroughly for compliance issues before a decision is made on the procedure.

At this time, the proposed operation would take place in a glovebox and tent containment system. The cracked pit would first be placed in the glovebox which would be purged to a $\leq$ 3% argon atmosphere and released through the task exhaust of the building in very small amounts. Initially, it would be attempted to remove the dry HE with a plastic spatula. If the HE cannot be removed dry, acetone would be applied and a plastic spatula would again be used to remove the HE. The pit would then be installed in a heat-sink assembly. The pit package would be installed in a 2030 container (pressure vessel) with aluminum pellets while still in the glovebox and sealed. When the 2030 container is removed from the glovebox, it would be purged with inert gas and leak tested. The sealed 2030 container would then be placed in a sealed inner containment vessel. Both sealed containers would be placed in an FL containment vessel which would be sealed.

Note

Waste streams resulting from this incident could include mixed waste comprised of HE and plutonium contaminated water (produced from the initial thermal shock process), HE contaminated with plutonium, foam inserts, acetone contaminated with HE and plutonium, anti-contamination suits, gloves, and support materials such as Kimwipes and swipes. Procedures would be developed for the treatment and disposal of all wastes associated with this activity. All procedures performed would be analyzed completely to evaluate compliance with regulatory issues.

B. ENVIRONMENTAL CONCERNS:

Will the project/activity during construction or operation result in changes and/or disturbances in the following entities? Provide a brief explanation where appropriate. If the proposed activity represents a commitment to a course of action that would ultimately require a positive response to one or more of the questions below, identify the question number and provide an explanation.

		yes	no			yes	no
1.	Air emissions	X		14.	Activity outside area fence/wildlife		X
2.	Liquid effluents	X		15.	Archeological/cultural resources		X
3.	Solid waste		X	16.	Noise levels	X	
4.	Radioactive waste/soil	X		17.	Radiation/toxic chem. exposures	X	
5.	Hazardous waste			18.	Pesticide/herbicide use		X
6.	Mixed waste (rad & haz)	X		19.	Explosives	X	
7.	Chemical storage/use	X		20.	Transportation issues	X	
8.	Petroleum storage/use		X	21.	Special status: habitat		X
9.	Asbestos waste		X	22.	Special status: species		X
10.	Water use/diversion		X	23.	Env. restoration proj.		X
11.	Drinking water system		X	24.	Other		X
12.	Sewage system		X				
13.	Clearing or excavation		X				

Explanation and qualification of specific responses of "yes":

Number Explanation

1. AIR EMISSIONS: Radioactive particles associated with the treatment activity would be captured by high efficiency particulate air (HEPA) filters attached to the glovebox and tent exhaust system. Any air emissions produced by solvents would be below the Texas Air Control Board permit and notification requirements. Procedures would be analyzed completely to evaluate compliance with regulatory issues. The argon purge in the glovebox would be hooked up to the building task exhaust, releasing at a rate of approximately 135 cfm (cubic feet per minute).

2. LIQUID EFFLUENTS: The HE/plutonium contaminated water used when the pit cracked has been containerized in a sealed reserve basin in Cell 1. Treatment and disposal procedures would be developed and approved.

4. RADIOACTIVE WASTE/SOIL: Low level radioactive waste would be generated when the amount of HE content does not exhibit the characteristics of the RCRA regulations. Potential low level radioactive waste generated could be anti-contamination suits, HEPA filters, Q-tips, and support materials. The low level radioactive waste would be staged in a CONEX in Zone 4 prior to shipment to Nevada Test Site. Procedures would be analyzed completely to evaluate compliance with regulatory issues. It is not anticipated that transuranic (TRU) waste would be encountered. If TRU or TRU/Mixed waste were generated, it would be packaged and staged at Pantex until an alternate site could be identified, pending ultimate disposal at WIPP, if approved for acceptance.